

more or less affected. A boy reported a ball of lightning, or fire, passing down his limbs; his hand, in contact with an iron sink, was scorched, showing how large a proportion of the discharge passed through him to the city water main, although he was 200 feet distant from the central electric discharge.

The electrician of the Weather Bureau (Mr. J. H. Robinson) informs us that in all his experience a house with a tin roof was never injured by lightning; he considers that a house having a tin or metal roof, connected by one or more rain spouts to the ground, is a much safer protector against lightning than the ordinary lightning rod. The great surface of the roof allows the electric discharge to diffuse in all directions and diminishes the chance of fire or death.

The Editor would be glad to receive from each of his readers a statement as to the statistics of relative damage done when flashes strike houses or barns having shingle, slate, or tin roofs. His own impression is that buildings in cities, which are usually covered with tin, are quite as apt to suffer as buildings in the country covered with shingles, slates, or tiles, and that buildings without lightning rods suffer more than those of the same kind with lightning rods.

It has been satisfactorily shown that an object placed within a metallic inclosure is entirely unaffected by any electric current that passes through the metallic covering, as the latter conducts the electricity around it. On this principle, important buildings have been protected by a network of wires and rods. In so far as a tin roof more or less completely incloses a building it affords similar protection; but as a severe flash would probably melt the soldered joints, and even the sheet-iron itself, we think it would be cheaper to use lightning rods to protect the tin roof from destruction.

The German insurance companies distinguish between "cold strokes," that do not set fire to buildings, and "hot strokes," that do produce conflagrations. Is the difference due to the flash or to the object that it strikes, or is it simply a question of the ratio between the intensity of the electric discharge and the conducting power, or the resistance, of the object through which the electricity must pass in order to reach the ground?

TEMPERATURE OF LAKE WATER.

The temperature of the water in quiet lakes and ponds must, in general, be colder in the winter season than in the summer. Of course the colder, denser water will sink to the bottom as the autumn and winter advance.

If the surface temperatures go down to 39° F. the surface water must sink to the bottom, and the lowest water must come up on account of its buoyancy. The measurement of temperatures at various depths in a lake will show when this interchange of top and bottom water is about to take place, and is, therefore, a matter of importance to the engineers in charge of the water supply of large cities, as well as to those engaged in the business of cutting ice. Of course there can be no formation of ice at the surface of still water until after this vertical interchange has taken place, and the temperature of 39° prevails throughout the lower part of the pond. In rapidly running water the conditions are somewhat different.

The measurement of temperatures at any depth is easily accomplished by means of some form of electric thermometer. The "Thermophone" of Warren and Whipple is peculiarly adapted to this work. Measurements of this kind were made on July 1, 1896, in Clear Lake, Lepreau Township, southwestern New Brunswick, by Prof. W. F. Ganong, and are published in the Bulletin of the New Brunswick Natural History Society. This lake is about one-third of a mile long and one-sixth of a mile broad, and its maximum depth is 78 feet, which is very deep for so small a lake. The temperatures observed at 11 different points showed that the water was very uniformly stratified as to temperature and density,

as might be expected from the fact that its outflow is very slight. The average result gives the accompanying table of temperatures and depths:

Depth.	Average temperature.	Depth.	Average temperature.	Depth.	Average temperature.
<i>Feet.</i>	°	<i>Feet.</i>	°	<i>Feet.</i>	°
3.....	65	30.....	47.6	57.....	43.0
6.....	65	33.....	46.2	60.....	42.6
9.....	65	36.....	45.0	63.....	42.5
12.....	65	39.....	44.3	66.....	42.5
15.....	64.7	42.....	44.1	69.....	42.5
18.....	63.9	45.....	43.6	72.....	42.5
21.....	59.2	48.....	43.5	75.....
24.....	54.7	51.....	43.0	78.....
27.....	50.7	54.....	43.0		

Although the last two depths were not measured, yet it is evident that they are not likely to have been less than 42.0°.

Mr. Ganong concludes that down to a depth of 12 feet the diurnal effect of solar heat is appreciable, and that the surface movements of the water, such as the waves due to the wind, help to distribute this heat uniformly; that below 18 feet the layers of water derive their temperatures by conduction from those above them.

Mr. Ganong also says that at depths below 30 feet the temperature is slightly higher at any given depth over shallower places than over deeper ones, indicating that the ground warms the water in contact with it, which is to be expected since it is a better conductor of heat; but this is a very slight matter, and, in general, the temperature depends on the depth from the surface and not on the height above the bottom.

As these observations were made on only one day in mid-summer, they can give us no information as to the changes in temperature of the whole pond with the season, not even its changes with the hour of the day, although undoubtedly the measurements made occupied the greater part of the day. The temperature of the air at the surface of the lake in the morning was 71° F., or 6° higher than the temperature of the surface of the water.

METEOROLOGY OF THE SECOND WELLMANN EXPEDITION.

The first Wellmann expedition sought to reach the North Pole in 1894 by way of Spitzbergen. It left Tromsø May 1, and reached Dane's Island May 7. After a long struggle near Spitzbergen, attaining latitude 80° 37' N., it returned to Tromsø, August 15. Mr. H. H. Alme, of the Meteorological Office at Christiania, Norway, accompanied the expedition as meteorologist and physicist, but Mr. Owen B. French, of the Coast and Geodetic Survey, Washington, was in charge of all the scientific work, and personally officiated as astronomer and geodesist. The meteorological records kept by Mr. Alme were reduced by him and forwarded to Washington through Professor Mohn, but so far as we know they have not yet been published. On account of the daily movements of the observer the principal value of such records is its use as a means to fill up the daily weather map for distant portions of the globe. Now that Mr. Wellmann has organized the second arctic expedition, via Franz Josef Land, the Weather Bureau has given Mr. E. B. Baldwin, observer, a furlough, in order that he may volunteer his services as meteorologist. Of course, the law providing for the Weather Bureau does not contemplate arctic exploration, or the pursuit of meteorology beyond the bounds of the United States, therefore, Mr. Baldwin must go without compensation from the Government.

The study of climatology is generally considered as an extremely local problem but the study of meteorology can never be so. The meteorologist must take in the whole atmosphere, horizontally and vertically, and our science is to

be congratulated that we have here one more volunteer who devotes himself, regardless of time and money, to the accumulation of the data needed for its advancement.

The Weather Bureau has, of course, assisted to the extent of its legal privileges by furnishing the expedition with apparatus, and it is hoped that Mr. Baldwin's enthusiasm will be rewarded, not only by a sight of the Polar Region, but by a fine collection of meteorological records.

NOTES FROM THE REPORTS OF THE CLIMATE AND CROP SECTIONS.

KENTUCKY.

Some excellent selections are given from Mr. Milton Whitney's article on climatology in a recent number of *Science*. The Editor has contemplated some remarks on this subject as he thinks that Professor Whitney's article ignores those features of the climate that affect animal life and human industry and considers only that narrower branch of the subject which might be called vegetable or agricultural climatology. The extracts published in the Kentucky report very discreetly avoid too narrow a definition of climatology. The development of plant life varies with the nature of the plant and the soil quite as much as it does with the climate; it would be impossible to agree as to what plant should be taken as the climatologic standard to which our methods should be adjusted so that the elements of climatology could be worked out by means of it. Climatologists have received with universal accord the ideas disseminated by Professor Hann, and the numerical elements of climatology, which are, perhaps, as many as thirty in number, have already been so widely accepted that it would introduce confusion if we give that word a meaning different from what is now recognized. It seems much wiser for those who are going into very detailed studies in botanical biology to use the term "botanic climatology," under which heading may be included many items relating to the soil that have nothing to do with other branches of climatology.

MARYLAND.

The report for April reproduces a leaflet issued by Prof. Wm. B. Clark, of the Maryland State Weather Service, in which he describes the work of the voluntary reporters in that State and the process of compiling the weekly crop bulletins that are issued before noon of each Tuesday during the growing season.

The work as briefly outlined above, has been continuous in this section since the establishment of the service in 1892. During that time the cooperating observers have increased in numbers and efficiency, and in nearly all cases the same observer has acted continuously since the first enlistment of his services, and his interest in the work has apparently advanced with the length of the record obtained. There are now 70 active voluntary stations in the section, and 100 crop correspondents report regularly during the season. The present status of the work is satisfactory in a general sense, but additional observers are needed in a few districts, and the number of crop correspondents must be increased before the entire territory can be said to be thoroughly represented. It is the desire and intention of the section director to make the Maryland and Delaware section of the Climate and Crop Service second to none in the country, and earnest efforts to that end will be vigorously carried on until a perfect service is firmly established.

MINNESOTA.

The extensive forestal interests of this State make it very important that the art of forestry as it is now understood in Europe, and as it has been so thoroughly exemplified in the writings of Dr. B. E. Fernow, should form a prominent subject in the matter of public education. No State containing extensive forests can afford to neglect this important subject. Attention is called to the fact that the State of New York is now the first on record to move in this important matter. For many years, Dr. Fernow, as Chief of the Division of Forestry in the Department of Agriculture, has urged

that the Federal Government take action with regard to the national forest lands. Our Federal policy is liable to vacillate but New York State policy is steadily improving. Dr. Fernow is called to be chief of the college of forestry established at Cornell University by the recent act of the State Legislature "to promote education in forestry and to encourage and provide for the establishment of a college of forestry at Cornell University." Dr. Fernow will have two assistants in the university and the management of 30,000 acres in the Adirondack Forest Preserve, as an object lesson for his students. When men have been properly trained by Dr. Fernow we may hope that they will have the care of all the forests of the State. There can be no doubt but that the expenditure of \$2 per acre will bring in a direct net income of \$4 or \$5 from these lands, and a much larger indirect one. It is not sufficient to merely set aside forests for preservation, we must actually care for them, otherwise they become useless as a source of income and liable to become destroyed altogether by fire.

Other States, such as Maine, New Hampshire, Virginia, the Carolinas, Pennsylvania, Georgia, Michigan, and Minnesota, may well follow the example of New York as to forests and a college of forestry.

NEW JERSEY.

The current report gives several references to the beautiful halo of April 4. This was observed between 8 and 9 p. m., by Prof. R. W. Prentiss, at Rutgers College, New Brunswick, N. J., and John H. Eadie, voluntary observer at Bayonne, N. J., whose reports are given in detail; the fact of its appearance at Bergen Point, Paterson, Boonton, Rancocas, and Camden may also be inferred from the list of dates of lunar halos. A "lunar corona" was reported at Summerville. These points lie in the northern and western half of New Jersey. The halo was also observed to be very brilliant throughout the whole length of New York City. Items regarding halos do not occur in the April report of the New England section, but there can be scarcely any doubt that from the region of Greater New York and the adjoining part of Connecticut, southwestward over northern New Jersey into Pennsylvania, there was during this evening a northeast wind carrying enough moisture to form a steadily increasing haze, which finally became a thick cloud of ice needles, followed by snow during the night. Before the haze was thick enough to entirely obscure the moonlight, and while the ice needles preserved their original delicate prismatic shapes, and while the moon was high in the heavens, conditions were favorable for the formation of lunar halos at stations that were so located that the moon's rays passed through this hazy cloud of ice prisms.

In answer to several letters the Editor will state, that notwithstanding the beautiful prismatic colors, observers should be careful not to apply the word "aurora" to such halos. The word "aurora" is specifically applicable only to the morning twilight, dawn, or daybreak, and to the aurora borealis, an electric discharge that often resembles the morning and evening twilights in some particulars, but need never be mistaken by a careful observer. The faint halo around the moon, the brilliant circle around the zenith, and the beautiful arch of rainbow colors within the latter circle, as described by several persons in New York City, were all due to the reflection and refraction of moonlight by ice crystals high in the air above the observer, forming incipient snowflakes and preparing for the snowstorm of the next morning. The circle about the zenith as a center, and passing horizontally through the moon is called the parhelic circle; it is due to moonlight reflected to the eye from the vertical sides of prisms that are descending to the earth, point foremost, or with their axes vertical. If the moon is about 30° in angular